Remarks

This Preliminary Amendment cancels, without prejudice, claims 1-7 in the underlying PCT Application No. PCT/EP2004/053011 and adds new claims 8-15. The new claims, _inter alia_, conform the claims to United States Patent and Trademark Office rules and do not add any new matter to the application.

In accordance with 37 C.F.R. § 1.125(b), the Substitute Specification (including Abstract) contains no new matter. The amendments reflected in the Substitute Specification (including Abstract) are to conform the Specification and Abstract to United States Patent and Trademark Office rules or to correct informalities. As required by 37 C.F.R. §§ 1.121(b)(3)(ii) and 1.125(c), a Marked-Up Version of the Substitute Specification comparing the Specification of record and the Substitute Specification also accompanies this Preliminary Amendment. Approval and entry of the Substitute Specification (including Abstract) are respectfully requested.
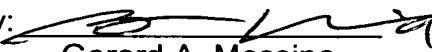
The underlying PCT Application No. PCT/EP2004/053011 includes an International Search Report, dated February 21, 2005, a copy of which is included. The Search Report includes a list of documents that were considered by the Examiner in the underlying PCT application.

Applicants assert that the subject matter of the present application is new, non-obvious, and useful. Prompt consideration and allowance of the application are respectfully requested.

Respectfully Submitted,

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Dated: 5/23/06

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[10191/4232]

NETWORK BRIDGE

Field Of The Invention

The present invention relates to a network bridge, in particular for coupling serial IEEE 1394 buses.

5   Background Information

Networks conforming to IEEE 1394 are made up, as shown in Figure 1, of a number of nodes K1 ... through Kn in the network, the theoretical maximum number of which is limited to 63 by the length of the corresponding node identifier (ID). The node ID for addressing the individual nodes has a length of 6 bits; the address 0xFF is

10   reserved as a broadcast address. If it is desired to connect more than 63 nodes, the possibility exists of connecting multiple separate buses B1, B2 via a network bridge (bus bridge) NB. These buses can in turn be individually addressed via a bus ID. The bus ID has a length of 10 bits, corresponding to 1,024 buses. Theoretically, therefore, 1,024 * 63 = 64,512 nodes can be connected into one network system.

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A serial bus conforming to IEEE 1394 supports the transfer of asynchronous and isochronous data. Whereas the reception of asynchronous data packets must be acknowledged by the receiving node in order to ensure reliable data transfer, no acknowledgment is necessary for isochronous data. Network bridges for coupling

20   multiple buses must support the transfer of both data types. At the same time, they must ensure that in more-complex topologies each data packet can reach its receiver, and that all the buses connected into the network system run on a synchronized cycle. Draft Standard IEEE 1394.1 specifies the functionality of such a High Performance Serial Bus Bridge, specifically for use in networks conforming to

25   IEEE 1394 b.

AdvantagesSummary Of The Invention

The network bridge as defined in Claim 1 — i.e.according to the present invention, having means for configuration and control of the network bridge, access being

30   provided, via interfaces, to some or all functional blocks of the network bridge for the polling and evaluation of useful data, operating data, and/or parameters, and for manipulation of those data and/or parameters, and thus of the functional blocks, on

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the basis of the evaluation—, makes possible static or dynamic management of the functional blocks within the network bridge. The network bridge is thereby capable of adjusting itself to varying boundary conditions in the network, and minimizing the resources required for the functionality of the network bridge.

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Insertion of an additional software layer into the network bridge architecture is particularly advantageous. This bridge management and configuration layer can access some or all other functional blocks via suitable software interfaces, and can both read out information from those blocks and modify parameters for their

10 functioning.

It is thereby possible, for example, inside or above that software layer, to calculate statistics about various functional parameters of the functional blocks. By way of further software layers located above the management and configuration layer, the

15 network operator or user can moreover directly or indirectly control the function of the network bridge.

In networks with varying operating parameters, for example varying data throughputs or varying packet sizes, it is thereby possible to optimally configure and utilize the

20 limited resources available, for example memory and/or line capacity. The outlay for constructing such a network bridge can thereby be reduced to a minimum, and the performance of the network bridge at the same time can be increased.

European Patent Application No. EP 0 933 900 A2 disclosesdescribes a network

25 bridge for an IEEE 1394 bus. The "bridge manager" provided therein is not, however, embodied to handle configuration and management of the functional blocks that are described in IEEE 1394.1. What is disloseddescribed therein is a management level not for configuration of the individual functional blocks, but at most for external functionality. The implementation according to the present

30 invention involves an optimization of internal functionality, ensuring that a network bridge conforming to IEEE 1394.1 can be constructed with the simplest possible hardware.

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Brief Description Of The Drawings

~~Exemplifying embodiments of the invention will be explained in more detail with reference to the drawings, in which:~~

5   Figure 1 shows networks conforming to IEEE 1394.

Figure 2   shows an architecture model for a network bridge~~; and~~.

Figure 3   shows the architecture model according to Figure 2 having means for
10   configuring and controlling the network bridge, and interfaces to the functional blocks
of the network bridge.

Detailed Description ~~Of Exemplary Embodiments~~

For better comprehension, the manner of operation of an architecture model for a
15   network bridge according to IEEE 1394 Draft Version 1.04 will first be presented,
before the actual invention is described.

The network bridge shown in Figure 2 is connected via its respective ports P1, P2, ...
Pn to two independent networks N1, N2, and can receive and transmit data. In
20   general, it will receive data from one network and transmit it into the other network.

The "Port," "Configuration ROM," "PHY," "Link," and "Transaction" functional blocks
correspond to those of a standard network node conforming to IEEE 1394. The
bridge additionally possesses routing maps RM and a routing unit RE for each of the
25   two networks. Information about the topology and node addresses in the respective
networks is kept in routing maps RM; and via routing unit RE, data can be
exchanged between the Link or Transaction layer and the temporary memories of
the network bridge (FIFO block F). According to IEEE 1394.1, FIFO block F is made
up of a number of individual FIFOs which temporarily store data that are to be
30   transported from one bus to the other. The network bridge additionally possesses
internal timers T ("cycle timers") which allow it to synchronize the cycles in the two
buses. Routing units RE, as well as the "Port," "Configuration ROM," "PHY," "Link,"
and "Transaction" functional blocks, are controlled via the portal control (PC)
functional units.
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According to the present invention, each functional block in Figure 3 possesses an additional interface I through which data can be read and/or written. By way of these interfaces I, management and configuration layer MK according to the present invention -- which can be embodied in hardware or, as presented above, in software

5   -- can manipulate statistical data, useful data, or parameters for the operation of the functional blocks. The collection of a variety of data makes it possible for the software layer according to the present invention to quickly prepare statistics about the current operation of the network bridge. Those data can in turn be used to optimize the operation of the functional blocks, for example by modifying parameters

10   within the functional blocks. One example is an IEEE 1394 network in which at times predominantly isochronous data, e.g. audio and video streams, and at other times asynchronous data, are transferred. By way of statistical evaluations, management and configuration layer MK (or software layers located above it) can recognize that the proportion of asynchronous data in the total data volume is sharply increasing. It

15   is then possible to reconfigure the flexible FIFO block, or stipulate appropriate parameters to it for automatic reconfiguration, in such a way that the memory regions for isochronous data are made smaller, and those for asynchronous data are enlarged. As a result, the network bridge can react quickly to changes, and need not constantly keep available memory regions for large isochronous and

20   asynchronous data sets.

A further example is a network in which unauthorized accesses to blocked memory regions are taking place, because of a defective node or an attack. In this case the network bridge not only can recognize the attacks, but can also suppress them and

25   thus ensure smooth operation of the rest of the network. To achieve this, it can stop transfer of the relevant data packets and, if applicable, can disconnect the defective device from the network by a direct intervention in its PHY configuration register. The other functional blocks of the network bridge can be controlled in similar fashion.

MARKED-UP VERSION OF SUBSTITUTE SPECIFICATION

Abstract Of The Disclosure

In a network bridge, means (MK) are provided for configuration and control of the network bridge (NB), access being provided, via interfaces (I), to some or all functional blocks (T, F, RM, RE, PC) of the network bridge for the polling and evaluation of useful data, operating data, and/or parameters, and for manipulation of those data and/or parameters, and thus of the functional blocks, on the basis of the evaluation.

(Figure 3)